

Research focus

In Germany alone, more than 10.000 people are newly diagnosed with oral cancer every year resulting in tumor and in the most cases jaw bone resection. In order to reconstruct the resulting bone defects, an alternative to autologous bone transplantation is needed. The future-oriented field of tissue engineering (TE) represents a promising alternative therapeutic modality which turns the intrinsic regenerative capacity of the human body into account in order to restore lost tissue function. This procedure includes patient-own stem cells which are optimally predestinated for the required cell type, growing within suitable biomaterials for the generation of 3D TE-constructs.

The research laboratory of the Department of Oral and Maxillofacial Surgery of the University Hospital Tübingen focusses its research on the field of bone tissue engineering. We are working with jaw and cranial periosteal cells as mesenchymal stem cell-like cell sources and characterize them in detail. Both primary cell types are able to differentiate into the chondrogenic, osteogenic and adipogenic lineage. For guaranteed success of biocompatible stem cell-based therapies, we established xeno-free in vitro cell cultivation protocols. In terms of rejuvenation and in order to create an unlimited cell source, we generated induced pluripotent stem cells and rejuvenated mesenchymal progenitors.

Regarding the material side, we test different biomaterials, try to improve their biological activities by surface biofunctionalization or by incorporation of factors activating needed functionalities such as osteoinduction and neovascularization.

Finally, in order to avoid immune responses after transplantation, in vitro developed constructs will be analysed concerning their interaction with immune cells and in terms of hemocompatibility.

The generated immortalized Tag-58 cell line (using a lentiviral vector) is derived from primary human cranial periosteal cells. This cell line is easily to handle and grow in DMEM:Ham's F12 (1:1 mixture) (incl. GlutaMAX-I), containing 10% FCS, 1% PenStrep/fungizide and G418 (0,25 mg/ml) for maintenance. The parental cells were able to differentiate osteogenically and the immortalized cell line keeps this feature. The cell line Tag-58 will be excellently suited for all kind of research in the field of bone / osteoprogenitor cell biology / bone regeneration.

We characterized this cell line in detail, as published in:

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Title: Phenotypic characterization of a human immortalized cranial periosteal cell line

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Our University Hospital website:

<https://www.medicin.uni-tuebingen.de/de/das-klinikum/einrichtungen/kliniken/zahn-mund-und-kieferheilkunde/mund-kiefer-und-gesichtschirurgie/forschung>

Our publications can be found at the ResearchGate site:

<https://www.researchgate.net/profile/Dorothea-Alexander/research>